

No. 696,101.

Patented Mar. 25, 1902.

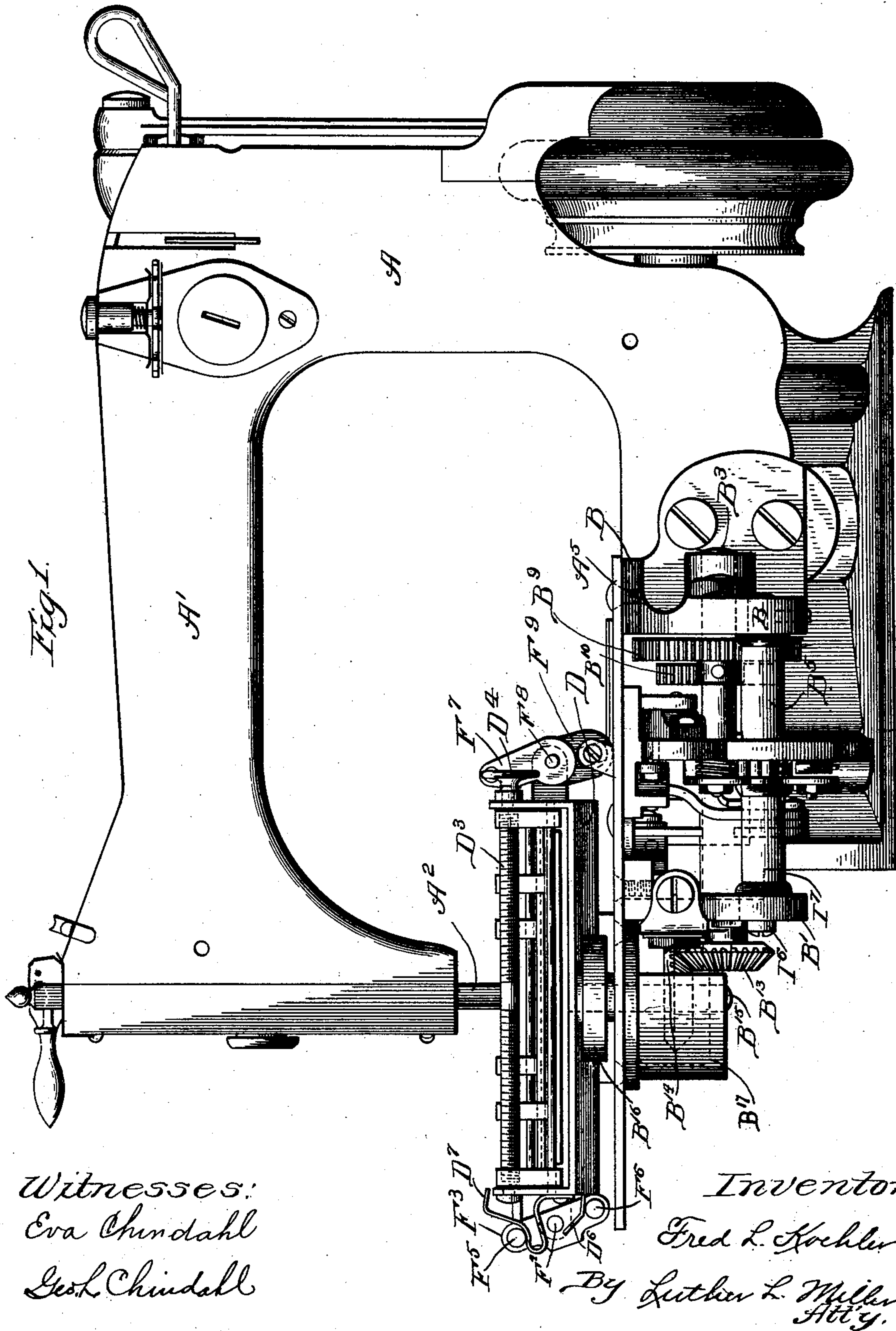
F. L. KOEHLER.

PLAITING APPARATUS FOR SEWING MACHINES.

(Application filed Feb. 5, 1902.)

(No Model.)

8 Sheets—Sheet 1.



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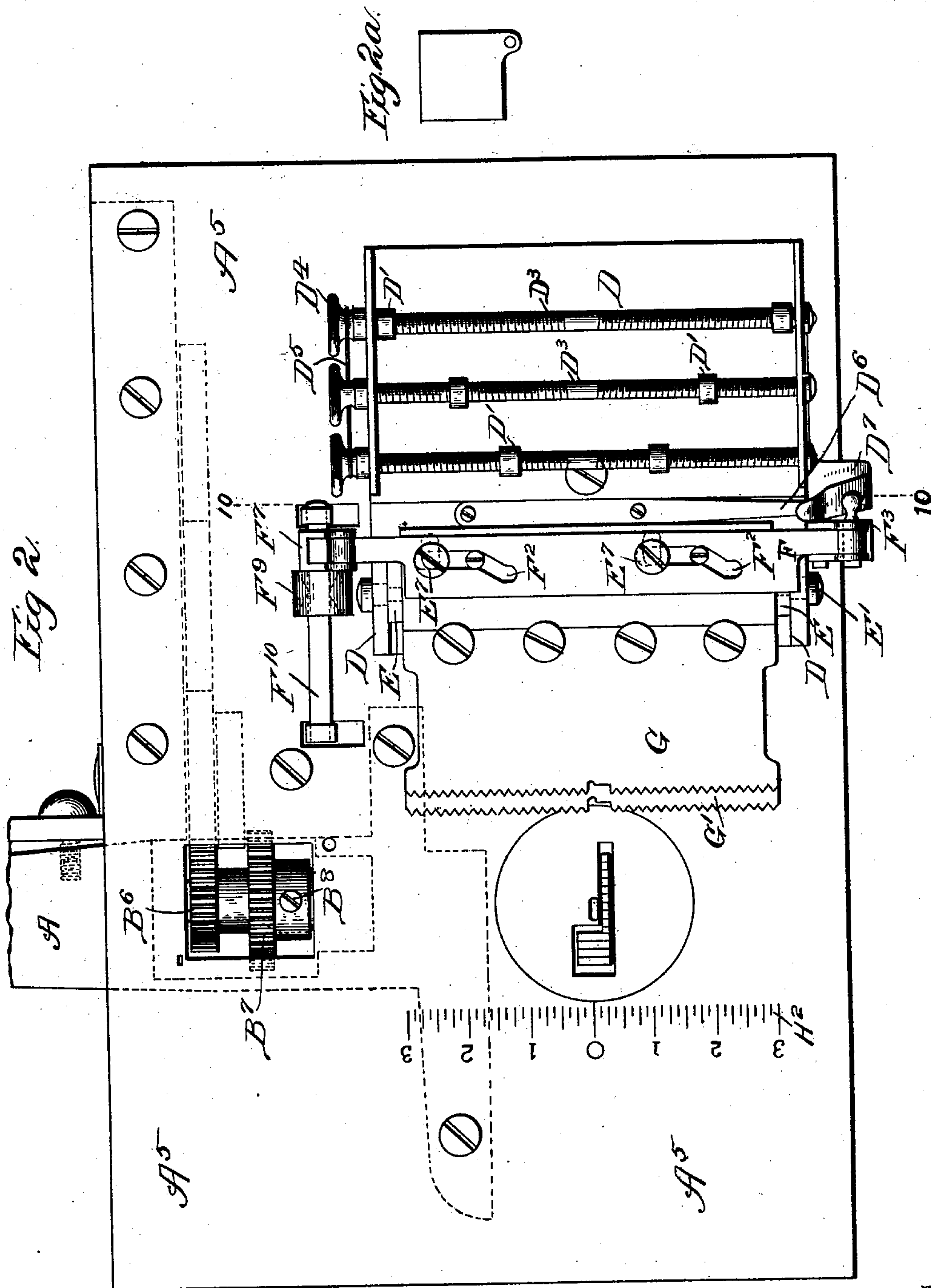
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8 Sheets—Sheet 2.



Witnesses:
Eva Chindahl
Geo. L. Chindahl

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By Luther L. Miller
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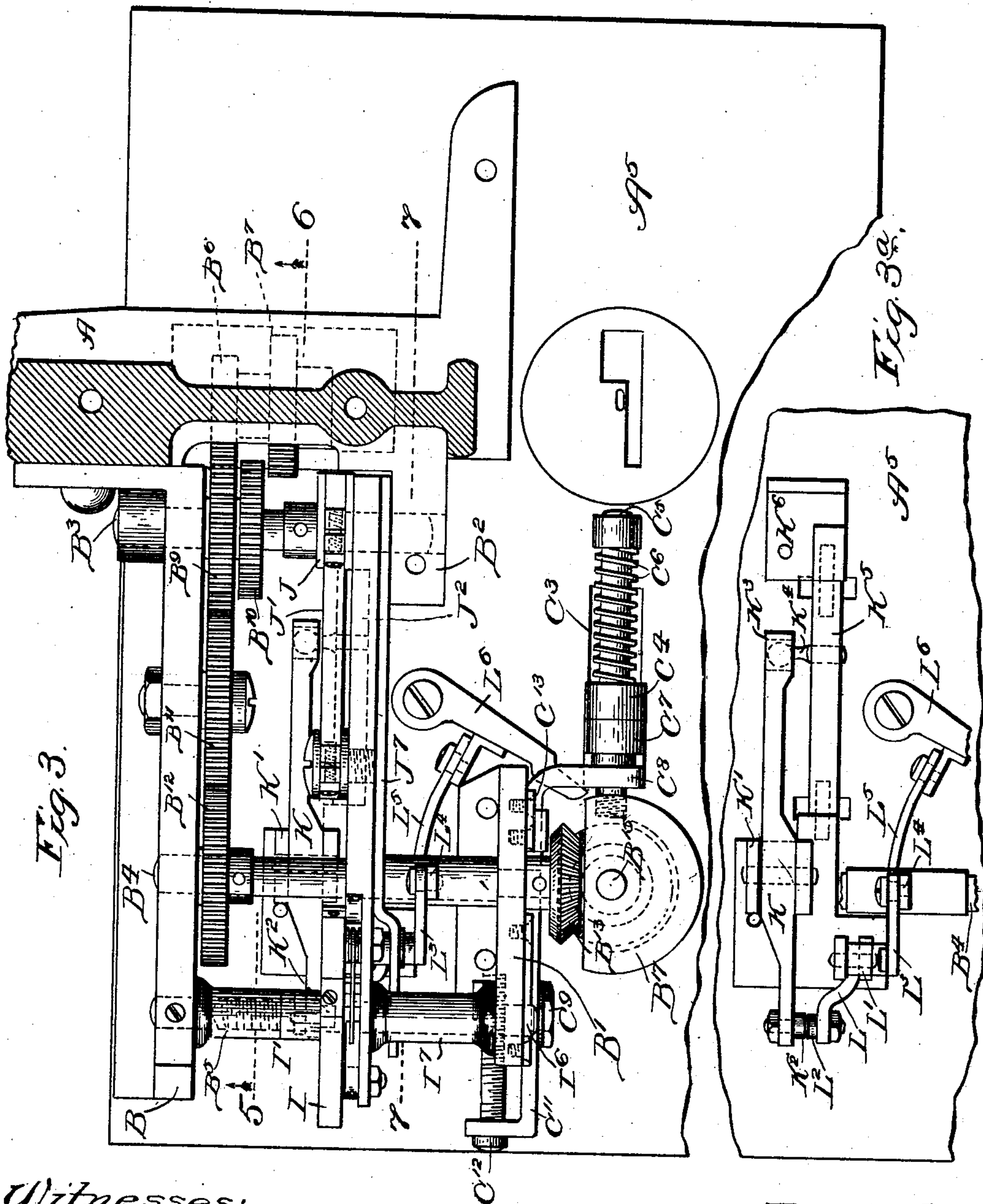
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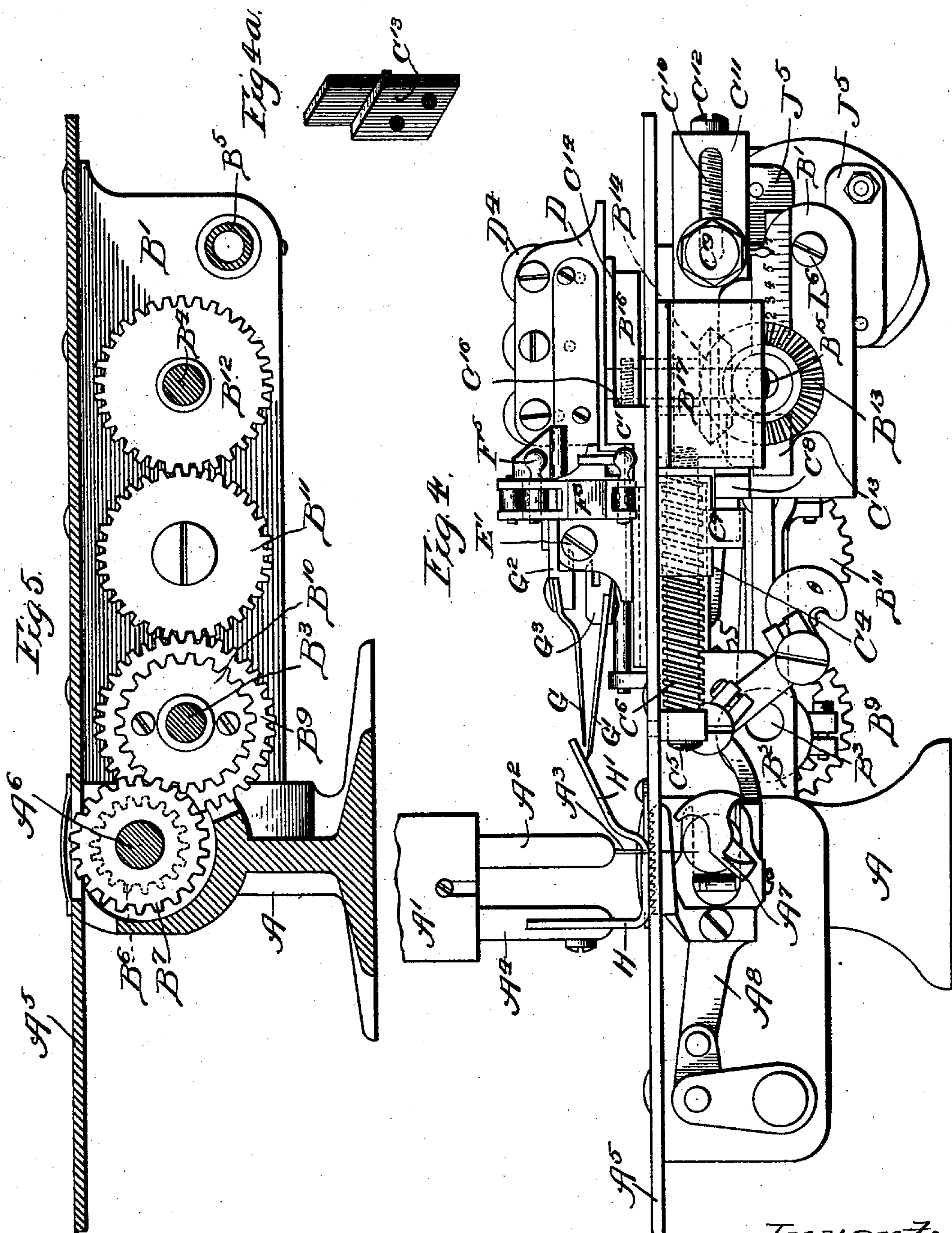
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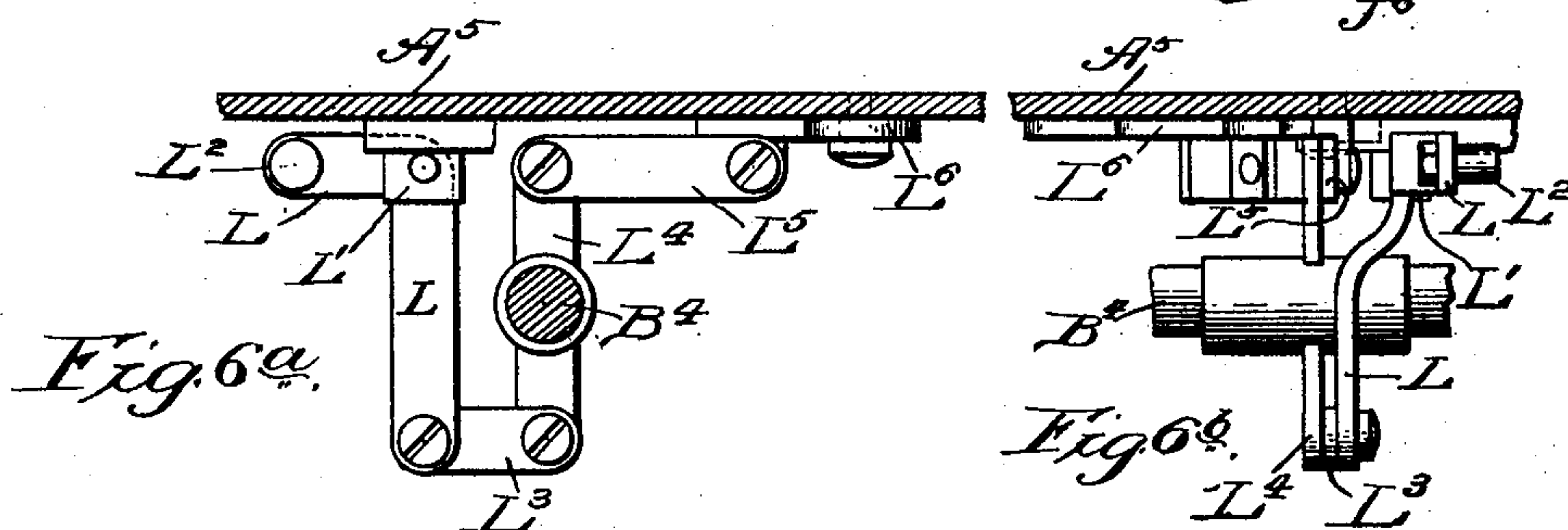
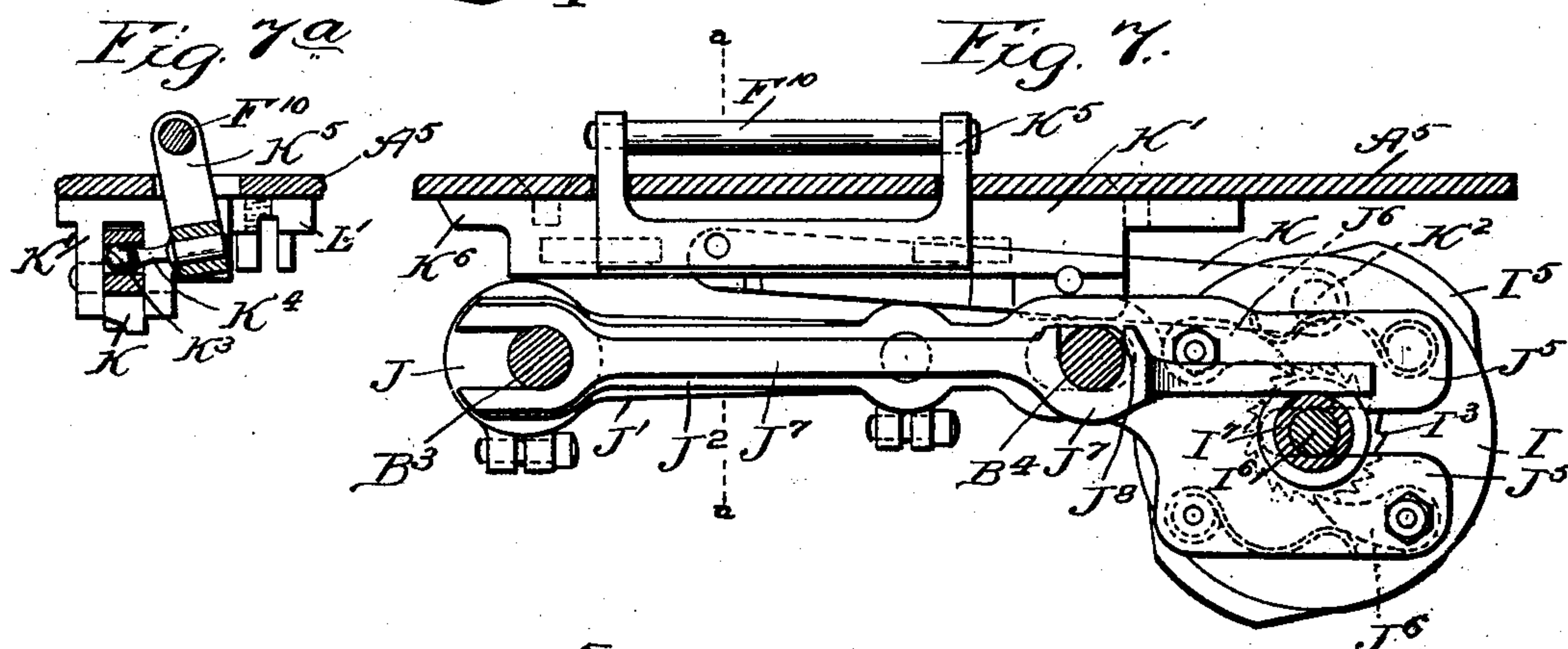
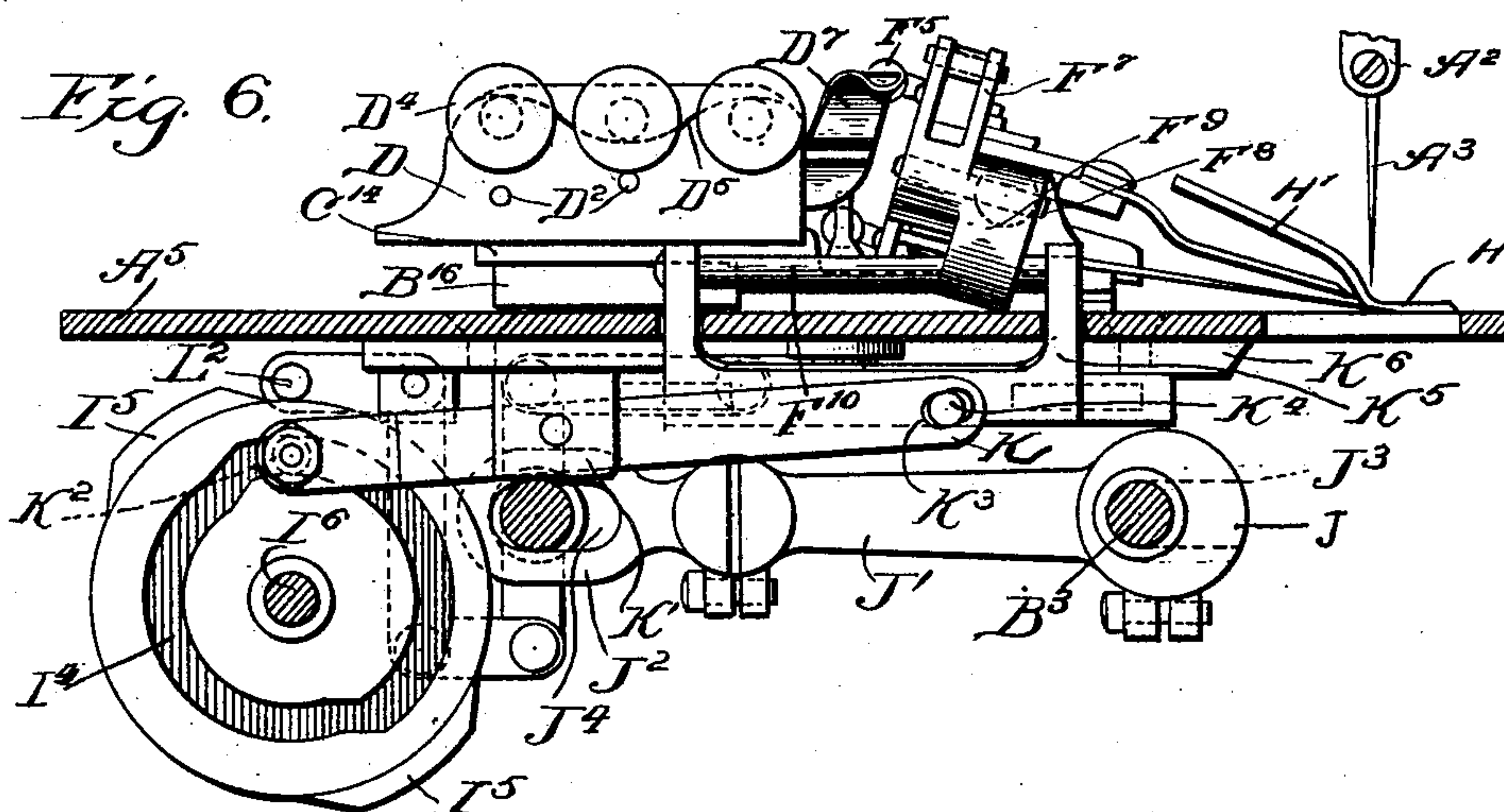
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8 Sheets—Sheet 5.



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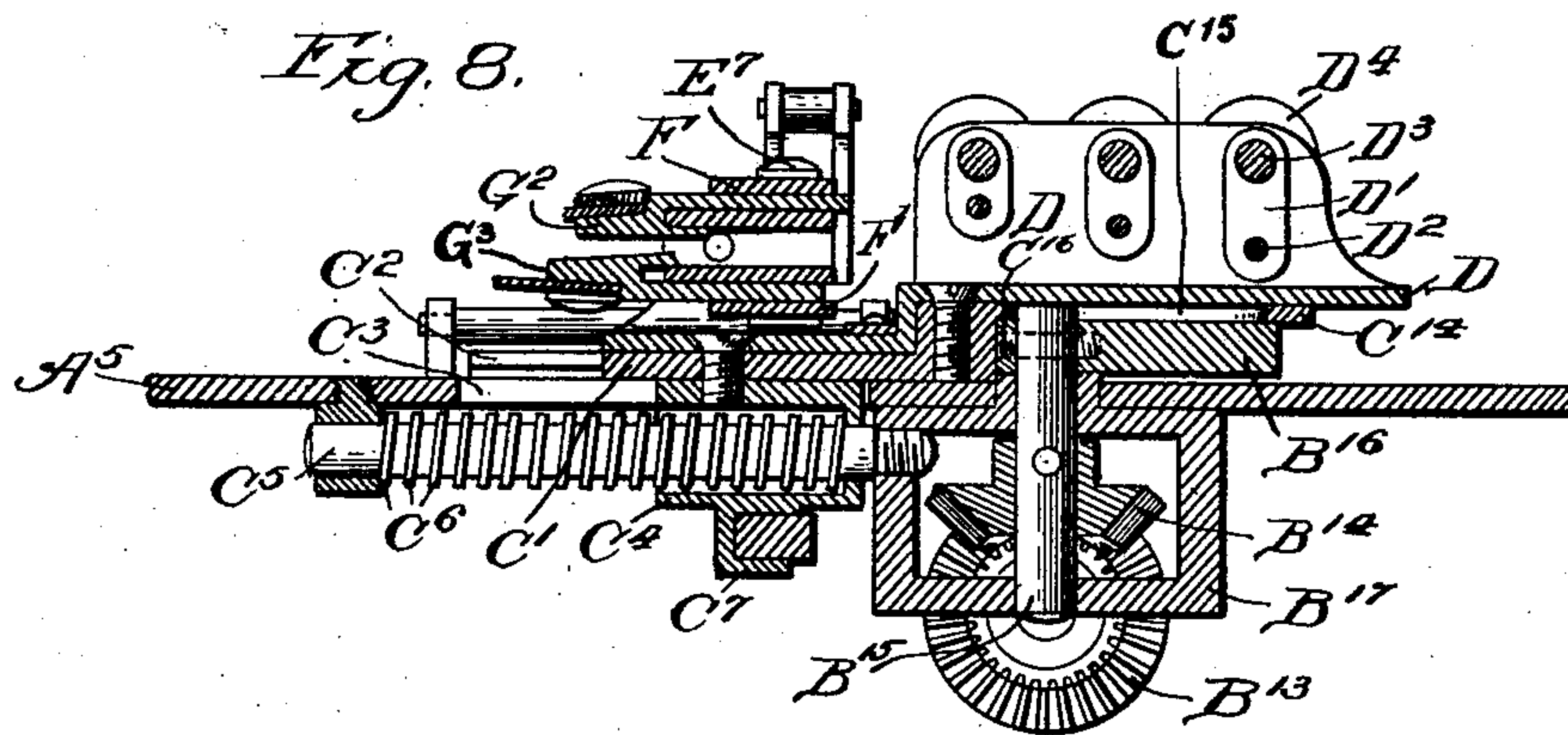


Fig. 9.

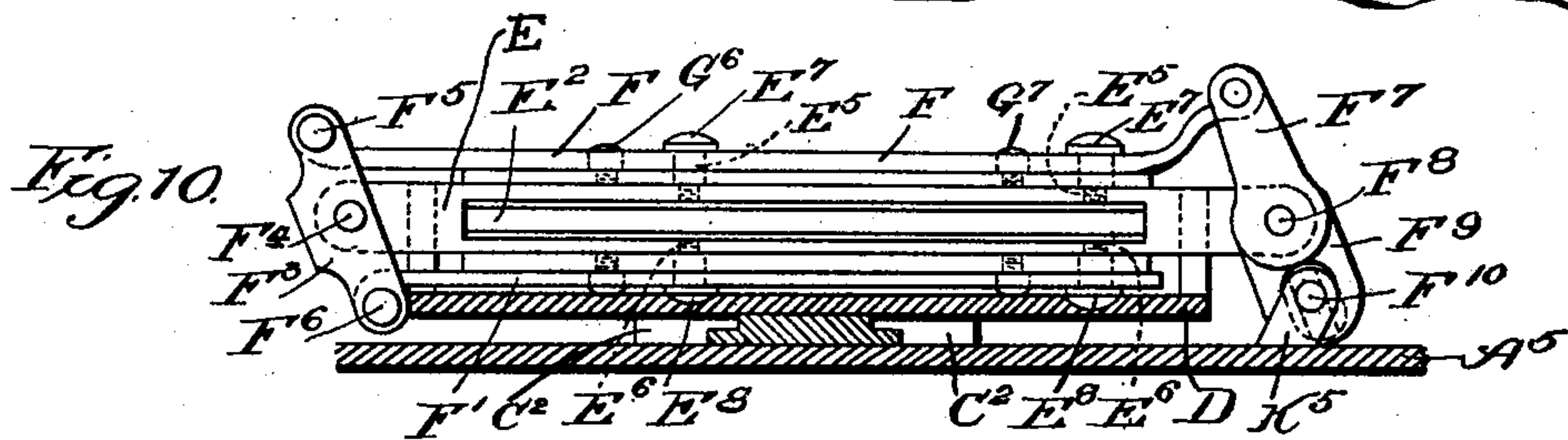
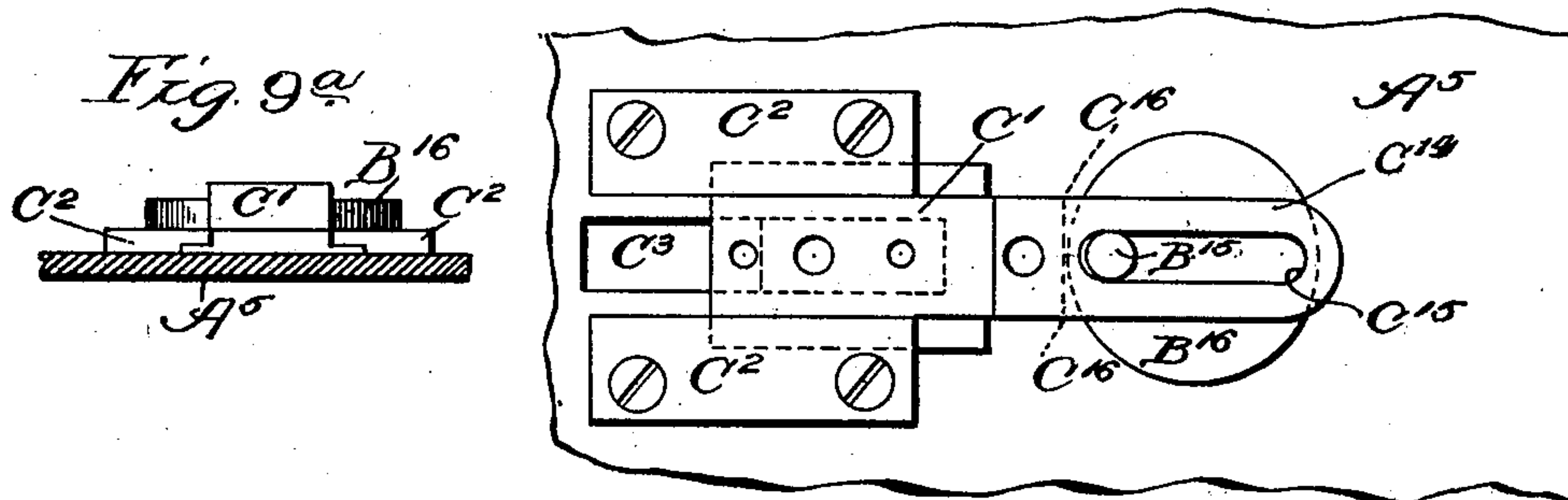


Fig. 11.

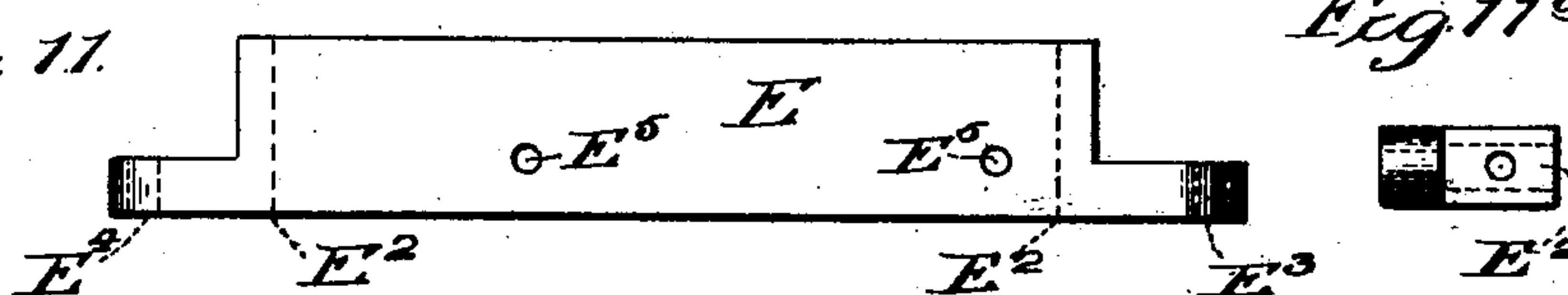


Fig. 11a.

Fig. 12.

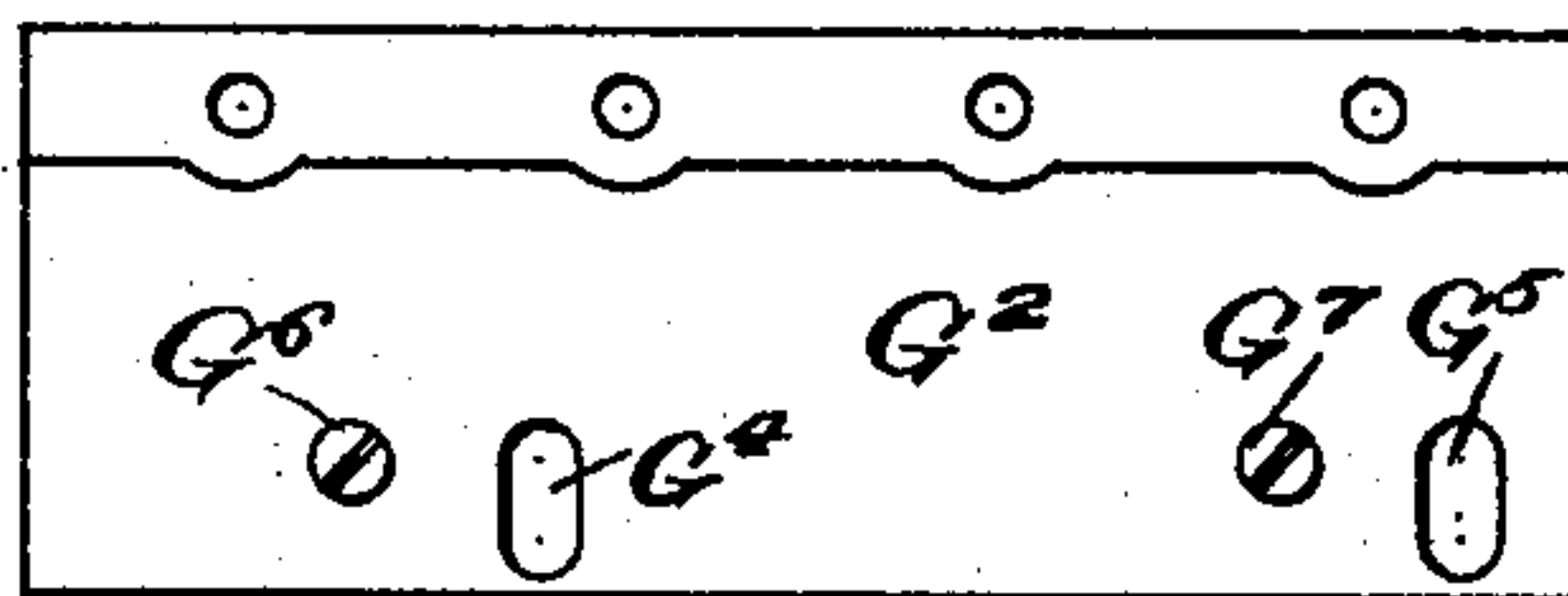


Fig. 12a.



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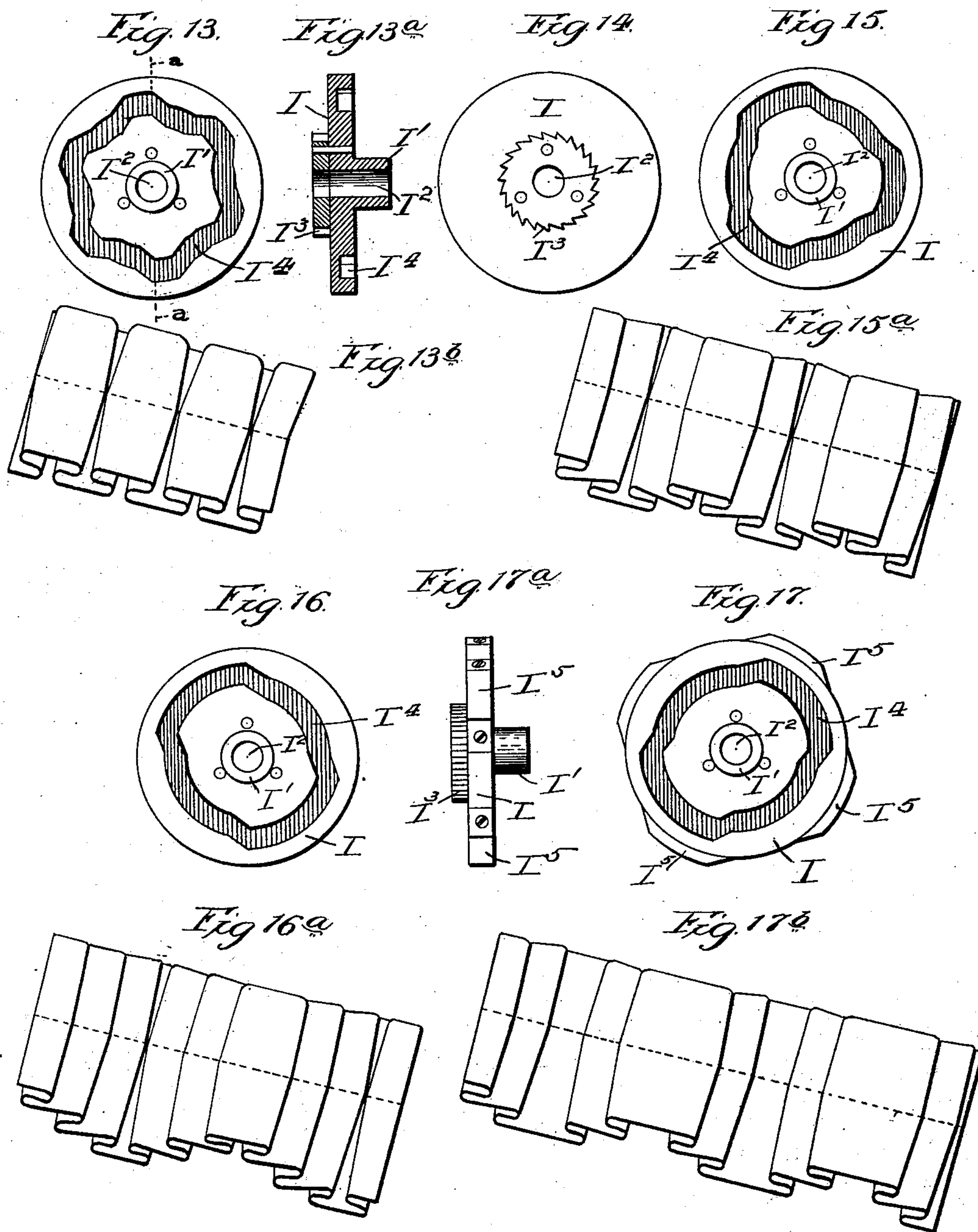
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Fig 18.

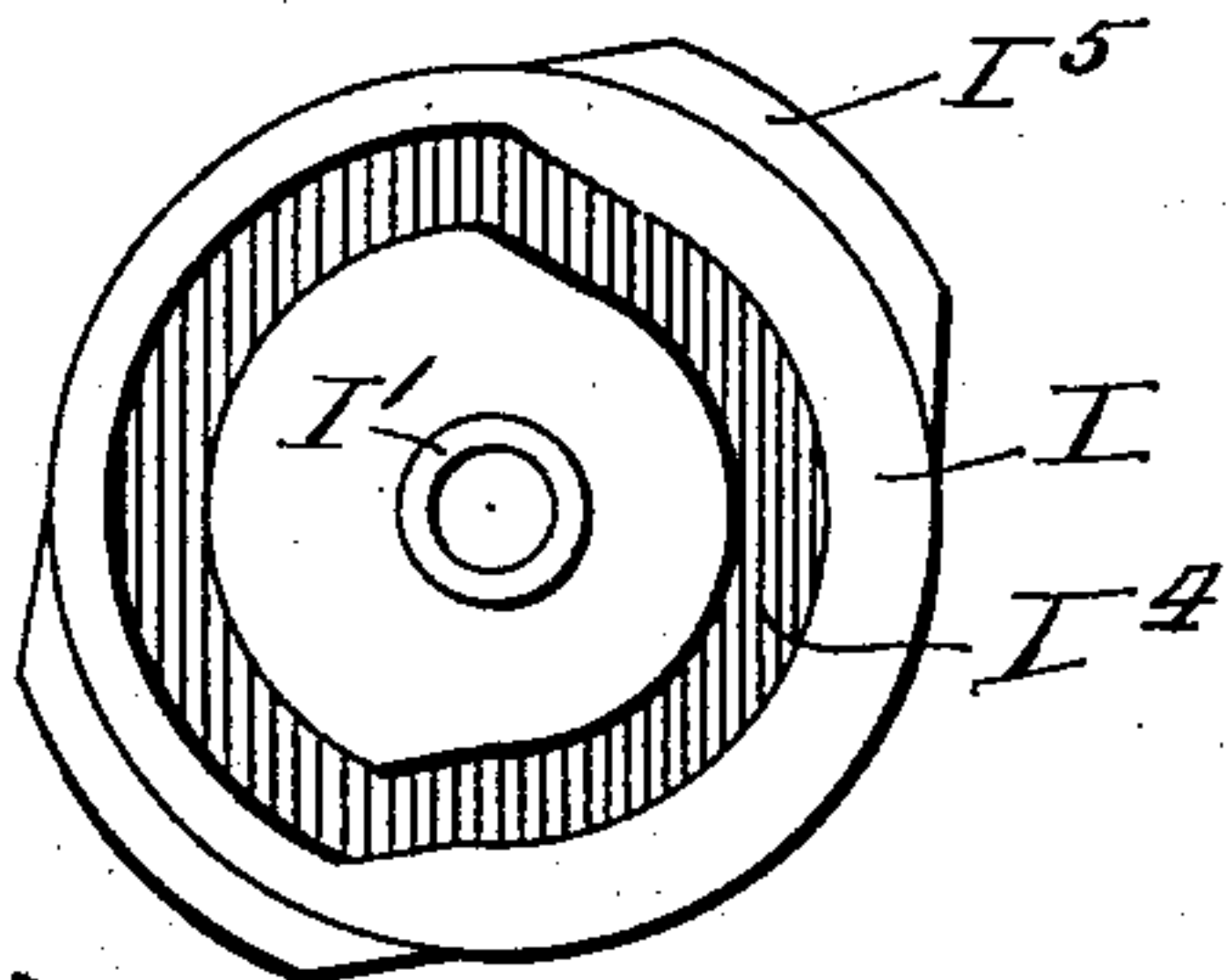


Fig 18^a

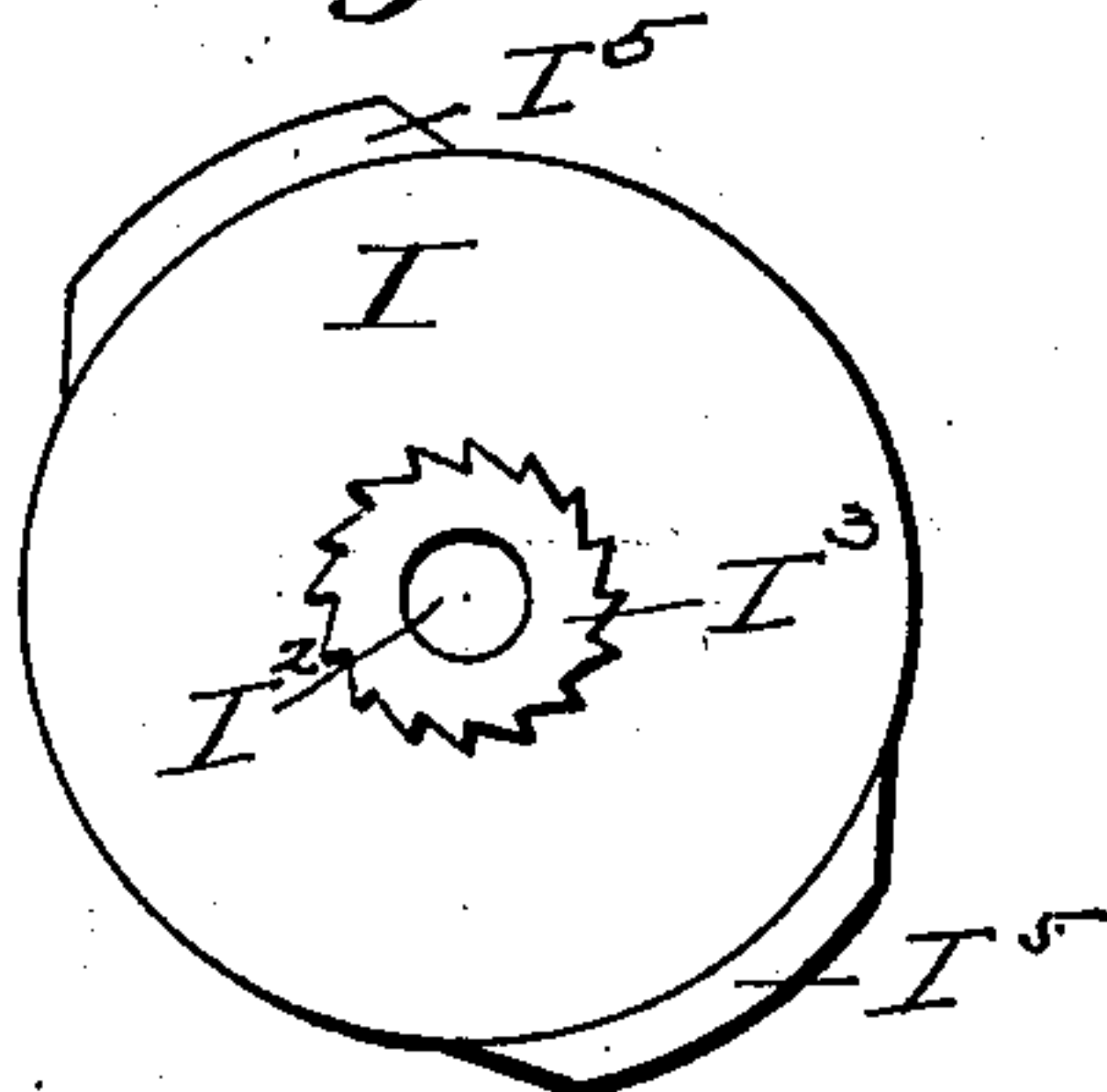


Fig 19.

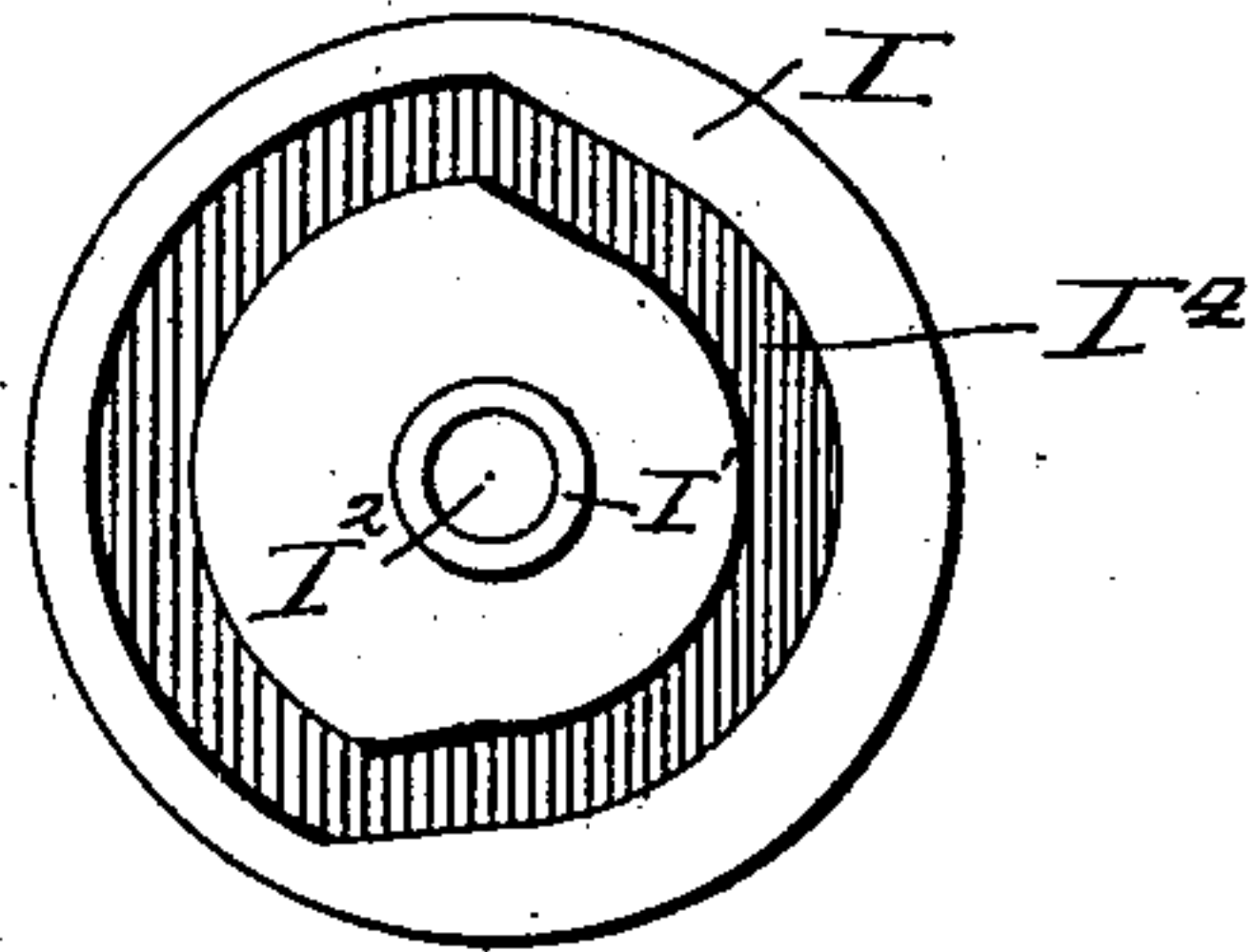


Fig 18^b

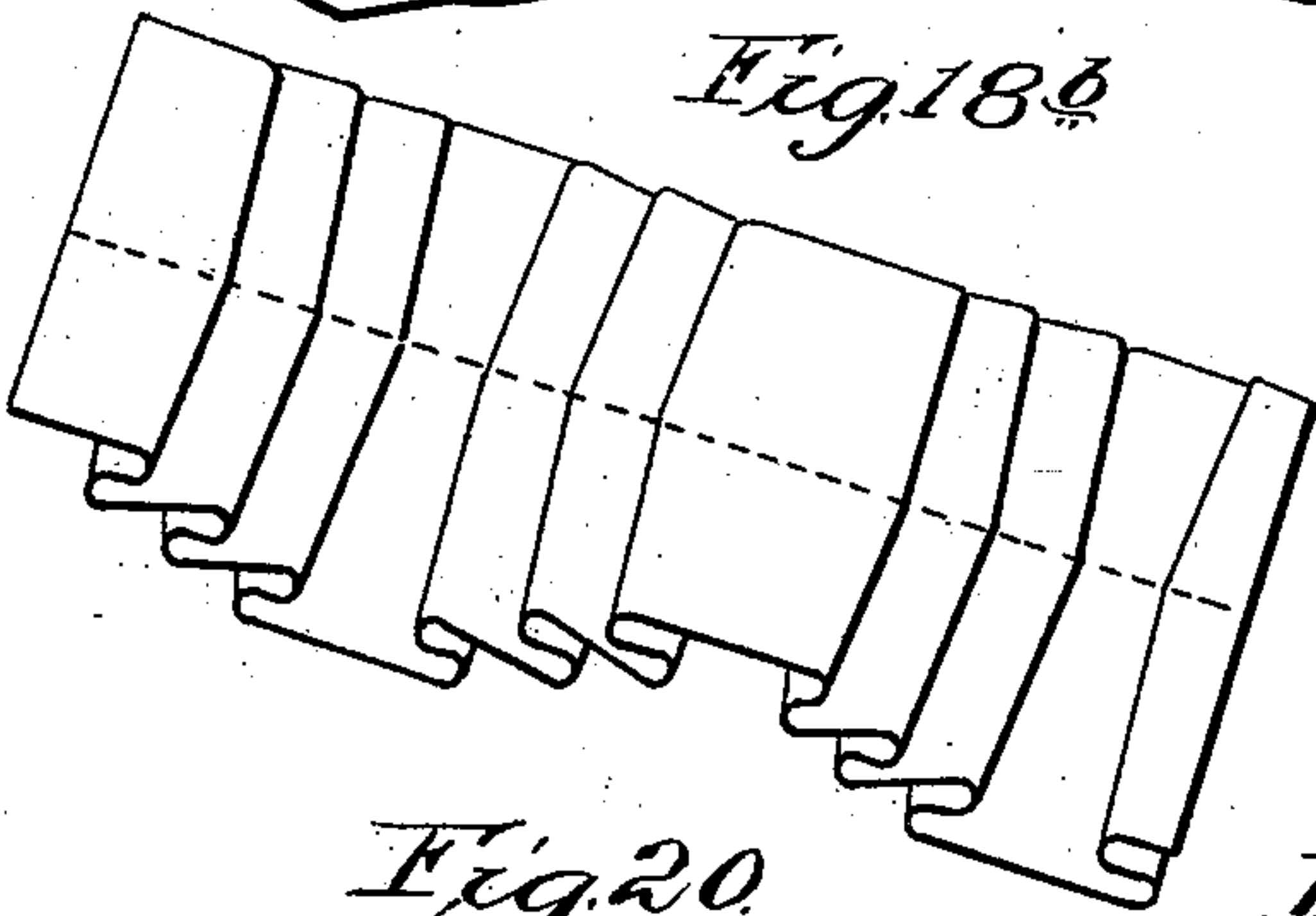


Fig 19^a

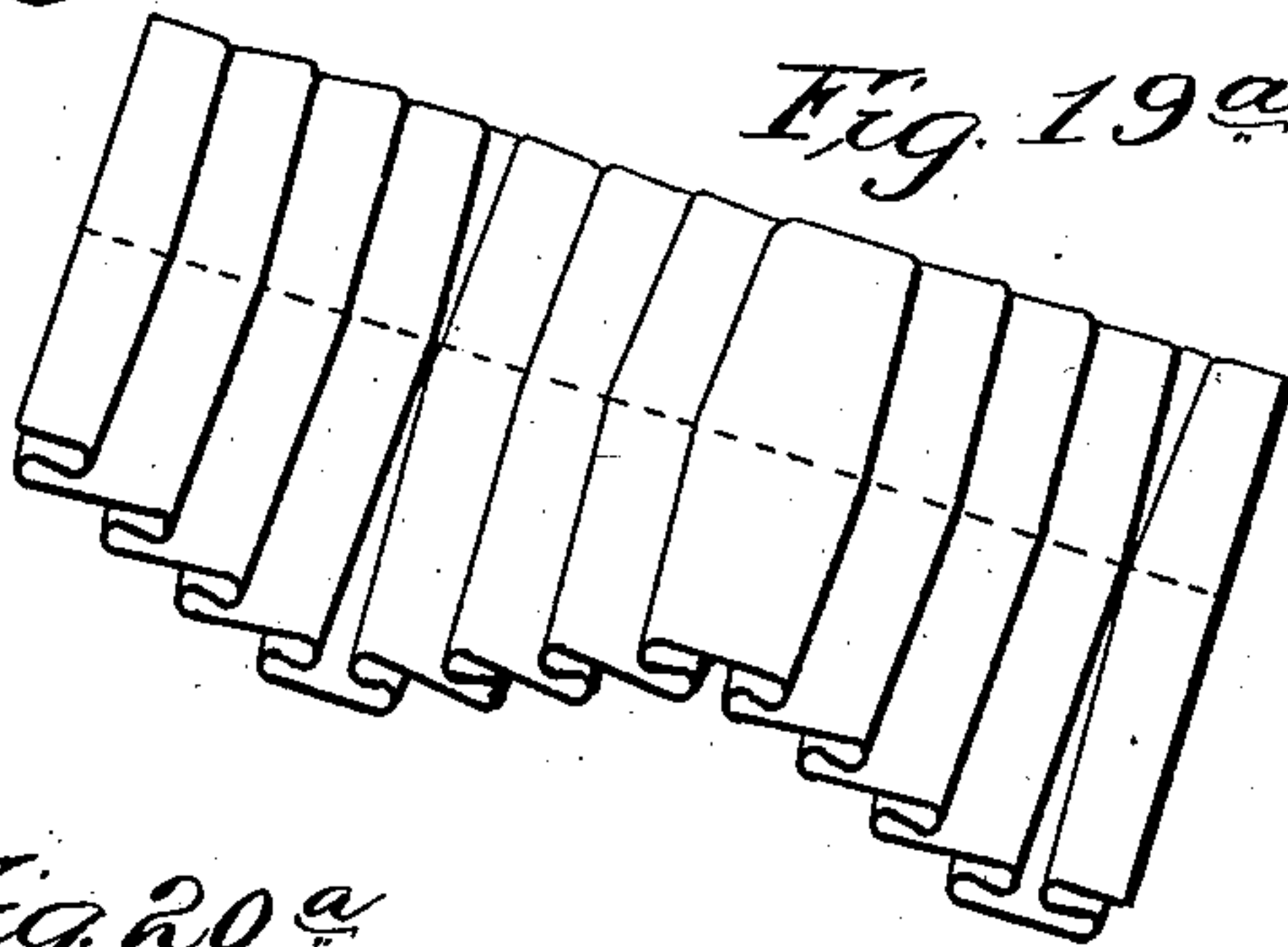


Fig 20.

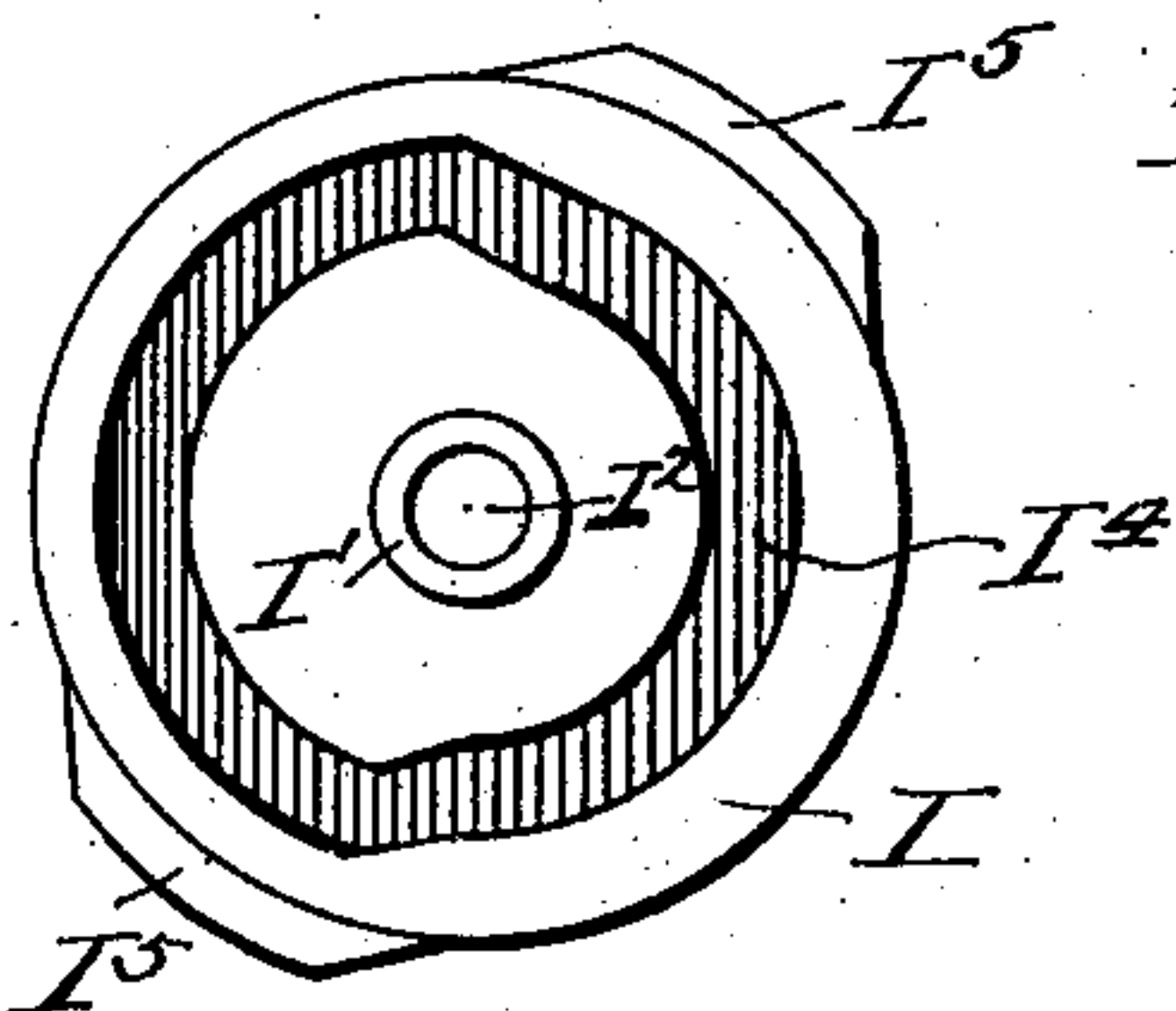


Fig 20^a

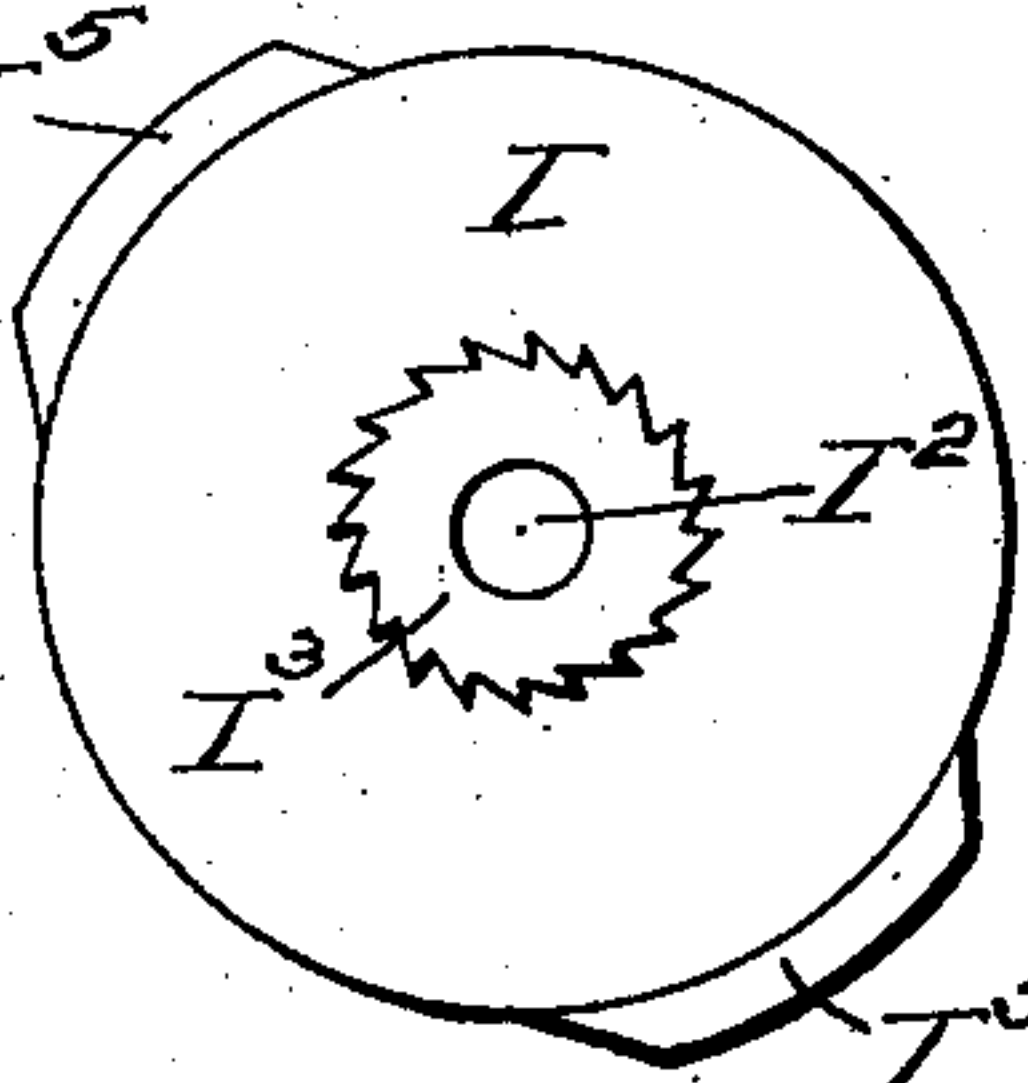


Fig 20^b

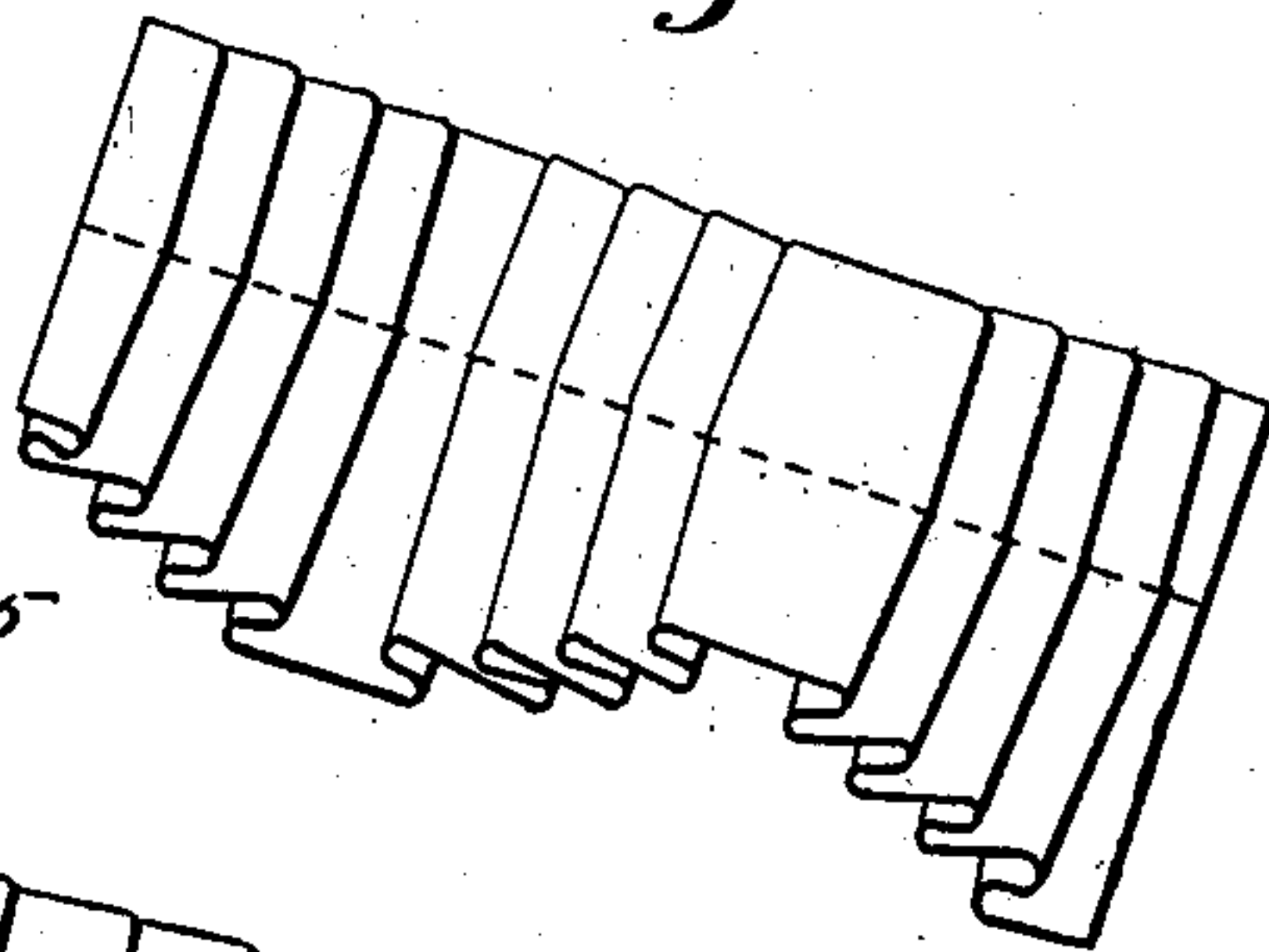


Fig 21.

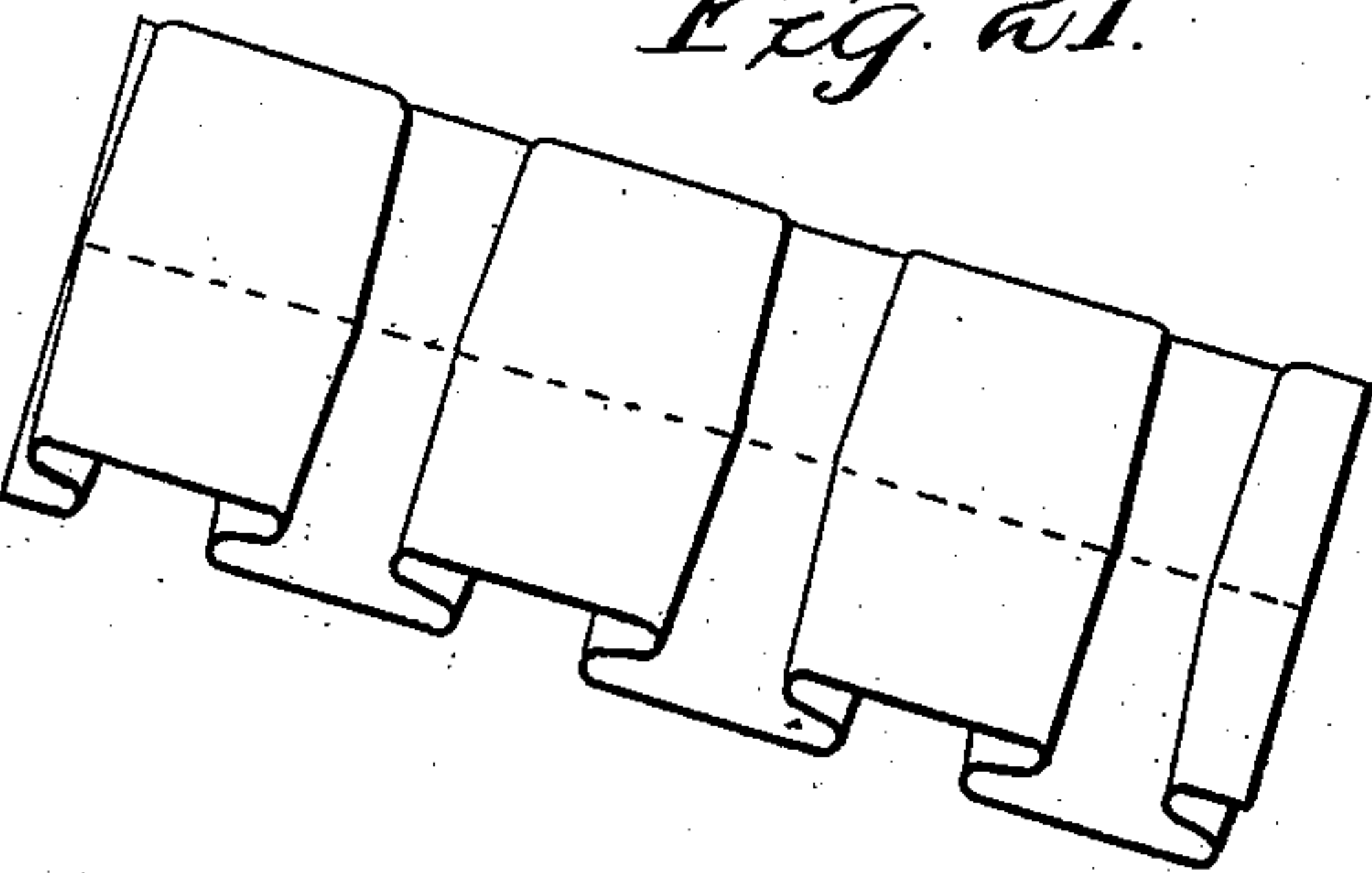
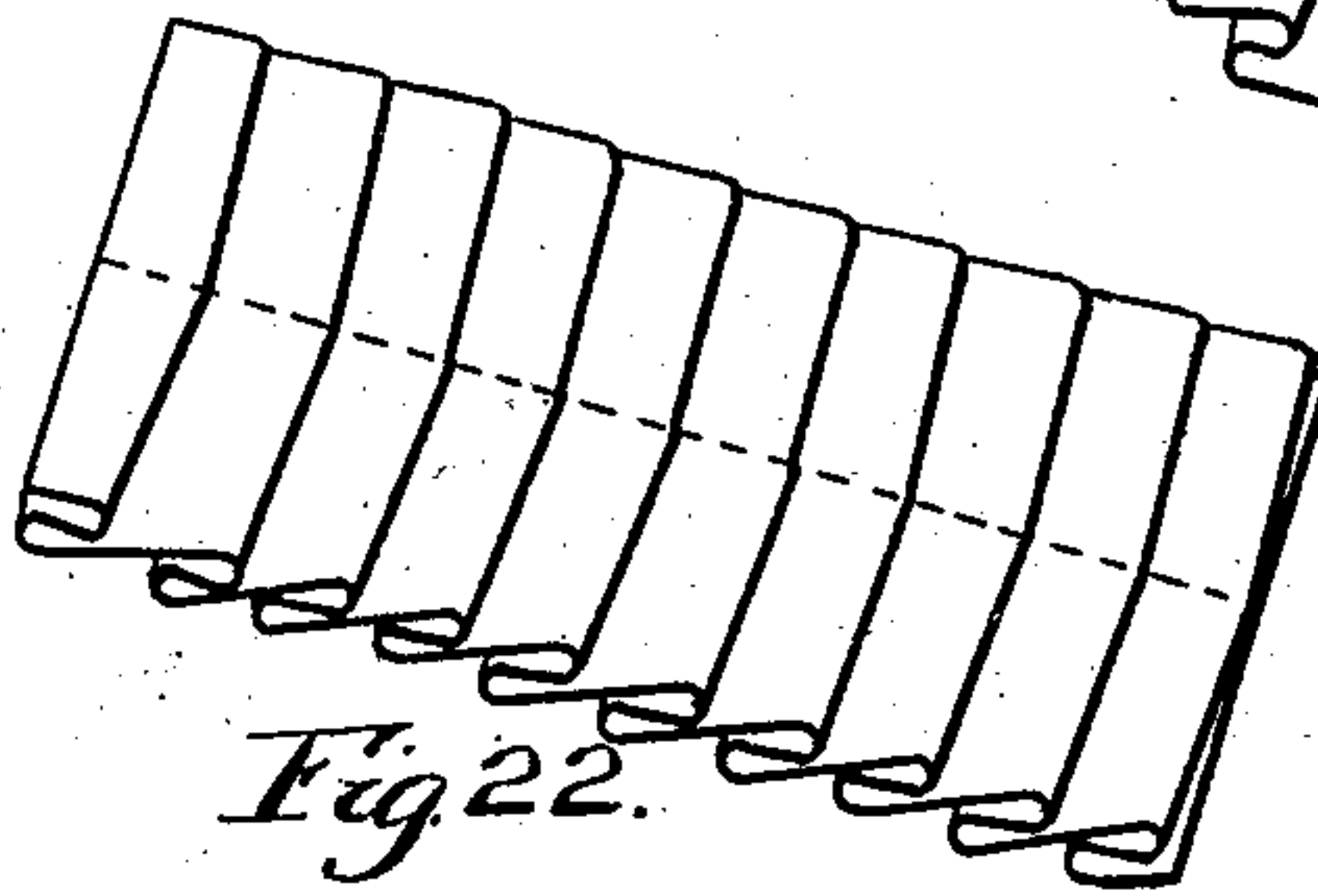


Fig 22.



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UNITED STATES PATENT OFFICE.

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THOMAS J. DUNNE, OF MARION, SOUTH DAKOTA.

PLAITING APPARATUS FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 696,101, dated March 25, 1902.

Application filed February 5, 1902. Serial No. 92,627. (No model.)

To all whom it may concern:

Be it known that I, FRED L. KOEHLER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Plaiting-Machines, of which the following is a specification.

The object of this invention is the production of an improved apparatus for plaiting fabrics.

In the embodiment herein shown of this invention a carriage for forming the fabric in plaits is arranged to be reciprocated above the work-plate and in front of the needle of the sewing-machine. On the forward side of said carriage—to wit, that side nearest to the needle—are two blades between which the ribbon of fabric to be plaited passes. These blades are mechanically connected in such manner that the forward edge of either may be caused to project beyond that of the other, accordingly as the plaits are to be turned under or over with relation to the body of the cloth under the needle, which change in the relative positions of said blades is accomplished automatically by a pattern-cam rotated by the mechanism. The depth of the plait is regulated by an adjustable stop that limits the rearward or receding movement of the carriage, and by an automatic mechanism arranged to be actuated by said pattern-cam the movement of the carriage may be stopped at certain intervals during the plaiting operation in order to leave a space between adjacent plaits.

Pattern-cams of different forms are necessary for the production of different kinds of plaiting. The form and direction of plait are regulated by the groove in the face of the pattern-cam. The spacing of the plaits upon the ribbon is controlled by the peripheral cam-surface of the pattern-cam. Where the plaiting is to be continuous, the peripheral surface of the cam is regular. The pattern-cam has an intermittent rotary movement, it being driven by pawls carried by a reciprocating bar, which pawls engage ratchet-teeth on said pattern-cam.

In the accompanying drawings, Figure 1 is a side elevation of a sewing-machine fitted with my improved plaiting mechanism. Fig.

2 is a plan view of that portion of the plaiter mechanism which lies above the work-plate of the sewing-machine. Fig. 2^a is a plan view of a closure for an opening in the work-plate, which opening provides access to the mechanism for the purpose of changing the speed of the plaiter with relation to the speed of the sewing-machine. Fig. 3 is an under side view of that portion of the plaiter mechanism which lies below the work-plate of the sewing-machine. Fig. 3^a is a detached plan view of that portion of the mechanism shown in the next-preceding figure which determines the direction of the plaits, also that part which holds the plaiting mechanism out of operation at certain intervals. The action of these mechanisms is controlled by the pattern-cam, the former by the cam-groove in the face of said pattern-cam and the latter by the peripheral cam-surface of said cam. Fig. 4 is an end elevation of a sewing-machine embodying the features of my invention. Fig. 4^a is a view of a clip used in the construction of the mechanism shown in Fig. 4. Fig. 5 is a vertical section on dotted line 5 6 of Fig. 3 looking in the direction of the arrows, showing the gearing for operating the plaiter mechanism at either of two different rates of speed. Fig. 6 is a vertical section on dotted line 5 6 of Fig. 3 looking in the direction opposite to that indicated by the arrows on said section-line. Fig. 6^a is a detached view, in side elevation, showing the arrangement of levers adapted to withdraw the plaiting mechanism from action. Fig. 6^b is an end view of the parts shown in the next-preceding figure. Fig. 7 is a vertical section on dotted line 7 7 of Fig. 3. Fig. 7^a is a transverse section on dotted line *a a* of Fig. 7. Fig. 8 is a transverse vertical central section through the reciprocating plaiting-carriage and its actuating mechanism. Fig. 9 is a fragmental top plan view of the work-plate of the sewing-machine, showing the plate for supporting the plaiting-carriage and the guides for said plate. Fig. 9^a is an end elevation of the parts shown in the next-preceding figure. Fig. 10 is a transverse section through the plaiting-carriage, taken on dotted line 10 10 of Fig. 2. Fig. 11 is a plan view of the blade-carrying bar. Fig. 11^a is an

end view of said blade-carrying bar. Fig. 12 is a plan view of the body portion of one of the plaiting-blades. Fig. 12^a is an end view of said body portion. Fig. 13 is a face view of a pattern-cam, showing the cam-groove therein. Fig. 13^a is a central section through said pattern-cam on dotted line *a a* of Fig. 13. Fig. 13^b is a representation of the form of plaiting made by the operation of the mechanism when controlled by the pattern-cam illustrated in Fig. 13. Fig. 14 represents the rear side of either of the pattern-cams shown in Figs. 13, 15, 16, and 17. Fig. 15 is a face view of another pattern-cam, and Fig. 15^a a representation of the work produced thereby. Fig. 16 is a face view of still another pattern-cam, and Fig. 16^a a representation of its work. Fig. 17 is a face view of a different pattern-cam, Fig. 17^a an edge view thereof, and Fig. 17^b a representation of the work done by this cam. Fig. 18 is a face view of another form of pattern-cam, Fig. 18^a the reverse side thereof, and Fig. 18^b a representation of the work done by this cam. Fig. 19 is a face view of another pattern-cam, and Fig. 19^a a representation of its work. Fig. 20 represents the face of a different pattern-cam, Fig. 20^a the reverse side thereof, and Fig. 20^b the work produced by this cam. Fig. 21 is a representation of single box-plaiting, the separation between the adjacent plaits indicating that the cam which produced it had a peripheral cam-surface, and therefore that the interrupting mechanism took part in the production of this plaiting. Fig. 22 represents plain side plaiting which is made without the intervention of either of the cam-controlled mechanisms.

Like letters of reference indicate corresponding parts throughout the several views.

As hereinbefore stated, my improved plaiter mechanism is used in conjunction with an ordinary sewing-machine, of which latter A is the standard; A', the arm; A², the needle-bar; A³, the needle; A⁴, the presser-bar; A⁵, the work-plate; A⁶, the looper-shaft; A⁷, the looper, and A⁸ the feeder mechanism.

To the under side of the work-plate A⁵, I secure the plates B and B' and the bearing-block B², supports for the plaiter mechanism. In suitable bearing-openings in the plate B and the bearing-block B², I journal the shaft B³ and between the outer end of the plate B and the plate B', also in suitable bearing-openings, the shaft B⁴.

B⁵ is a stud, internally perforated and screw-threaded, projecting inward from the plate B, its purpose being to assist in supporting the pattern-cam, to be later described herein.

The looper-shaft A⁶ is provided with two spur-gears B⁶ and B⁷, fastened rigidly together, the latter of which gears is of twice the diameter of the former. They are capable of being fixed to said looper-shaft by means of the screw B⁸ and of being shifted longitudinally on said shaft in order to change the speed of the plaiting mechanism, as will here-

inafter more fully appear. The shaft B³ carries two gear-wheels B⁹ and B¹⁰, fixed to said shaft and adapted to be engaged by either of the gears B⁶ and B⁷. An idler-gear B¹¹ meshes with said gear B⁹ and conveys motion from said gear to another spur-gear B¹², rigidly mounted upon the shaft B⁴. The opposite end of the shaft B⁴ carries the bevel-pinion B¹³, meshing with a similar pinion B¹⁴, rigidly fixed to the lower end of the short vertical shaft B¹⁵. The upper end of the shaft B¹⁵ carries the eccentric B¹⁶, the end of said shaft projecting slightly above the upper face of said eccentric. A housing B¹⁷ incloses the bevel-gear B¹⁴ and forms a bearing for the lower end of the vertical shaft B¹⁵.

I will now describe the carriage for supporting the plaiting-blades. This carriage is mounted upon the plate C', lying within the guides C², secured to the upper side of the work-plate A⁵ on opposite sides of an elongated opening C³, extending through said work-plate. The plate C' has secured to its lower face a longitudinally-perforated hub C⁴, surrounding a rod C⁵, rigidly supported underneath the work-plate. A coil compression-spring C⁶ surrounds the rod C⁵ and, lying between the fixed support for one end of said rod and said hub, exerts a pressure upon the latter that tends to throw the carriage to its rearmost position. A buffer-shoulder C⁷ upon said hub C⁴ is faced with leather or other suitable material and is adapted to engage the adjustable stop C⁸ and limit the rearward movement of the carriage, thereby also limiting the depth of the plait. The adjustable stop C⁸ is adapted to be locked in any desired position by means of the machine-bolt C⁹, which passes through the elongated opening C¹⁰ in the stop-bar C¹¹ and enters a suitable screw-threaded opening in the plate B'. The position of the stop-bar C¹¹ is adjusted by turning the screw C¹², which screw lies in a screw-threaded opening in the plate B'.

C¹³ is a clip for securing the stop-bar C¹¹ to the plate B'. The supporting-plate C' of the carriage has a raised rear end C¹⁴, which latter is provided with an elongated opening C¹⁵, adapted to receive the upper end of the vertical shaft B¹⁵. The eccentric B¹⁶, fixed on the shaft B¹⁵, has a bearing against the shoulder C¹⁶ of the supporting-plate, and when said vertical shaft B¹⁵ is rotated the eccentric B¹⁶ impinges upon said shoulder C¹⁶ and throws the carriage forward against the action of the compression restoring-spring C⁶, said spring returning the carriage to its rearmost position as the rotation of the eccentric B¹⁶ permits.

D is the frame of the reciprocating-carriage. At its rear end it is provided with several pairs of guide-fingers D', slidably mounted upon the rods D², extending transversely across said carriage, said fingers being adapted to be moved upon said rods by the screw-threaded feed-rods D³, having right and left hand threads at their opposite ends,

and the milled heads D^4 , intended to be grasped by the operator to adjust the position of the guide-fingers. The several pairs of guide-fingers are intended to guide ribbons of different widths when several thicknesses of ribbon are being plaited together.

D^5 is a piece of spring-wire bent in yoke form, adapted by its frictional engagement with the milled heads D^4 to prevent accidental movement of the screw-threaded feed-rods D^3 .

D^6 is a leaf-spring, turned upward at its forward end, secured to the upper side of the carriage-frame D , and D^7 is a curved spring of thin material secured to one side of the carriage-frame. The springs D^6 and D^7 are for a purpose to be mentioned later herein.

Near the forward end of the carriage the blade-carrying bar E is pivotally mounted upon the screws E^1 , extending through suitable openings in the sides of the carriage-frame. This blade-carrying bar is provided with a throatway E^2 , through which the ribbon or ribbons pass from the guide-fingers D^1 to the plaiting-blades, to be later described herein. At its ends the bar E is provided with the transverse openings E^3 and E^4 and upon each its upper and lower faces with the threaded openings E^5 and E^6 for receiving the screws E^7 and E^8 , respectively.

F and F' represent two cam-bars having a sliding connection with the blade-carrying bar E by means of the screws E^7 and E^8 , the cam-bar F lying above the blade-carrying bar, and the cam-bar F' lying beneath said bar. Each of the cam-bars is provided with two elongated cam-openings F^2 , each opening having a portion extending parallel with one edge of the bar for receiving the screws E^7 and E^8 , also having a portion extending diagonally from said first-mentioned portion, adapted to receive studs projecting from the body portion of each of the plaiting-blades, to be later described herein.

At one end of the blade-carrying bar the cam-bars F and F' are connected by means of the oscillatory cross-head F^3 , pivotally mounted intermediate its ends upon the pin F^4 , extending through the opening E^4 in one end of said blade-carrying bar.

F^5 is the pin which forms the pivotal connection between the upper end of the oscillatory cross-head and the upper cam-bar F , and F^6 the pin which forms the pivotal connection between the lower end of said cross-head and the lower cam-bar F' . These pins F^5 and F^6 are extended somewhat from the side of the cross-head in order that they may alternately engage the two springs D^6 and D^7 , attached to the carriage-frame D . At its opposite end the upper cam-bar F has a pivotal connection with the upwardly-extending arm F^7 , which latter is pivotally mounted upon the pin F^8 , extending through the transverse opening E^3 in one end of the blade-carrying bar E . A link F^9 , offset from the arm F^7 , but formed integral therewith, extends downward from the pivotal pin F^8 and

is adapted to be oscillated by a rod F^{10} , supported by a yoke above said link, which rod is adapted to be moved by the mechanism below the work-plate, as will more fully hereinafter appear.

The plaiter-blades G and G' have the body portions G^2 and G^3 , respectively, which latter lie between the cam-bars F and F' and the blade-carrying bar E , one blade-body being above and the other below said blade-carrying bar. Each blade-body is provided with two openings G^4 and G^5 , elongated transversely of said body portion, which elongated openings are adapted to receive the screws E^7 and E^8 for connecting the blade-bodies to the blade-carrying bar, yet permitting a forward-and-backward movement of each blade with reference to said bar. Each of the blade-bodies is also provided with two studs G^6 and G^7 , so situated with reference to the openings G^4 and G^5 that said studs shall lie within the diagonal portion of the cam-openings F^2 in the cam-bars F and F' . It will thus be seen that by the arrangement of the mechanism just described a longitudinal movement of the cam-bars will produce a relatively forward-and-backward movement of the plaiting-blades and that by reason of the connection of the cam-bars through the oscillatory cross-head F^3 one blade will be moved forward when the other is moved backward.

The plaiter-blades are held elevated from or depressed against the work-plate accordingly as the projecting pivotal pin F^5 or the pin F^6 engages the spring D^7 or the spring D^6 , respectively. The spring D^7 is secured to the carriage-frame D in such position that when the upper cam-bar F is moved from left to right, Fig. 1, the spring will be engaged by the pin F^5 , and the forward edge of the blades will be elevated, and when said cam-bar is moved in the contrary direction the pin F^6 is caused to engage the upturned end of the leaf-spring D^6 , and the forward edge of the blades will be depressed.

H is the presser-foot for the sewing-machine, secured in any suitable manner to the lower end of the presser-bar A^4 . The forward side of the foot (that side nearest the operator) is curved upward and over toward the plaiter-blades, presenting a concave guide-surface H^1 , against which the plaiter-blades impinge when elevated.

H^2 is a scale marked upon the work-plate A^5 at the rear of the presser-foot, its purpose being to enable the operator to center the ribbon with reference to the needle A^3 .

I is a pattern-cam having a central hub I^1 , provided with the perforation I^2 . On the rear side of the cam the hub I^1 is provided with ratchet-teeth I^3 . A cam-groove I^4 is formed in the face of the pattern-cam, and upon certain of the cams a peripheral cam-surface I^5 is formed. The pattern-cam is mounted upon the screw I^6 , between the plates B and B' , which screw enters and engages with the integral screw-threaded stud B^5 . A spool I^7

surrounds the screw I⁶ and holds the bifurcated end of the reciprocating rod, to be later described herein, in contact with the pattern-cam.

5 An eccentric J is fixed upon the shaft B³. It has the usual connecting-rod J' pivotally attached to the reciprocating bar J². This bar is supported by the shafts B³ and B⁴, it having the elongated openings J³ and J⁴ for
10 receiving the shafts B³ and B⁴, respectively, and permitting the reciprocation of said bar thereon. The outer end of the bar J² is bifurcated, and each of its branches J⁵ carries a spring-actuated pawl J⁶, which pawls face
15 in opposite directions and are adapted to engage the ratchet-teeth upon the rear side of the pattern-cam in order to rotate said cam at each forward and each backward movement of the bar J².

20 J⁷ is a filler-bar. This bar is shown fully in Figs. 3 and 7. Its office is merely to hold the reciprocating bar J² in its proper position upon the shaft B³ and with relation to the pattern-cam I. When the cam is to be moved,
25 the filler-bar is withdrawn in order to permit the reciprocating bar to be slid bodily with the shaft B³ away from the pattern-cam. The filler-bar is bifurcated at its rear end to receive the shaft B³, has a side opening J⁸ for
30 receiving the shaft B⁴, and its forward end rests upon the spool I⁷, so that the filler-bar cannot be withdrawn until the screw I⁶ and the spool I⁷ have been removed.

K is a lever pivotally mounted near its middle portion within the bracket K', secured to the under side of the work-plate A⁵. One
35 end of this lever carries a roller K², adapted to lie within the cam-groove I⁴ in the face of the pattern-cam I. An eye K³, extending transversely through said lever K, is adapted to receive the end of a stud K⁴, projecting
40 sidewise from and rigidly secured to an oscillatory yoke K⁵, pivotally mounted between the brackets K' and K⁶ underneath the work-plate A⁵. The two arms of the yoke K⁵ extend upward through suitable openings in the
45 work-plate A⁵ and support between their upper ends the rod F¹⁰, which is the rod hereinbefore mentioned as passing through the link
50 F⁹, pivotally mounted upon the pin F⁸ of the blade-carrying bar.

When the looper-shaft A⁶ is rotated, motion is imparted by the spur-gear B⁶ thereon to the spur-gear B⁹ on the shaft B³, or if a higher
55 speed of the plaiting mechanism relative to the movement of the sewing-machine is desired the spur-gear B⁷ is moved into mesh with the corresponding gear B¹⁰ on the shaft B³. The rotation of the shaft B³ rotates the
60 eccentric J, fixed thereon, and causes a reciprocation of the connecting-rod J'. This movement of the connecting-rod reciprocates the bar J² and intermittently rotates the pattern-cam I one tooth at a time as the teeth of
65 said cam are engaged first by the pawl of one of the forks J⁵ and then by the pawl of the other fork of the reciprocating bar J². The

roller K² of the lever K, lying in the cam-groove I⁴ in the face of the pattern-cam I, moves the lever K upon its pivot. The move-
70 ment of the lever K rocks the oscillating yoke K⁵ upon its pivotal supports and, through the link F⁹ and the arm F⁷, moves the cam-bars F and F' and shifts the plaiting-blades forward and backward with relation to each
75 other. This movement of the cam-bars shifts the pin F⁵ into engagement with its spring D⁷ or the pin F⁶ into engagement with its spring D⁶, raising the forward edge of the blades against the concave guide portion of the
80 presser-foot H or depressing the forward edges of the blades against the work-plate A⁵. If the blades are raised, the lower blade projects forward beyond the upper one. If they are lowered, the upper blade projects beyond
85 the under one.

The rotation of the shaft B³, being imparted through the gears B⁶ or B⁷ to the shaft B⁴ and from this shaft, by means of the bevel-gears B¹³ and B¹⁴, to the vertical shaft B¹⁵, rotates
90 the eccentric B¹⁶, fixed on said vertical shaft, moving the carriage bodily forward and backward before the needle A³. The length of the rod F¹⁰ is sufficient to permit the link F⁹ to travel with the carriage, said link, how-
95 ever, always being subject to the sidewise movement of said rod.

I will next describe the mechanism which in certain plaits throws the carriage forward at intervals, holding it in this inoperative po-
100 sition for an instant. This modified action of the mechanism produces a plaiting having spaces between adjacent piles of box-plaiting. Only certain ones of the pattern-cams are intended to operate this interrupting device, in-
105 asmuch as a large portion of plaiting is continuous—that is to say, is made without spaces between adjacent box-plaits. The cams which actuate the interrupting device have the peripheral cam-surfaces I⁵. Those cams
110 which have circular peripheries do not actuate it, and the work produced by the mechanism when under control of the last-mentioned cams is a continuous plaiting.

L is a bell-crank lever pivotally mounted
115 upon the bracket L', secured to the under side of the work-plate A⁵, one of the arms of which lever carries the roller L², adapted to lie in contact with the peripheral cam-surface I⁵ of certain of the pattern-cams. The other arm
120 of this bell-crank lever is connected by means of the pivotal link L³ with the rock-arm L⁴, loosely mounted upon the shaft B⁴. The opposite end of this rock-arm has a pivotal link L⁵, connecting it with a finger L⁶, pivotally se-
125 cured to the under side of the work-plate A⁵. The free end of the finger L⁶ is adapted to engage the hub C⁴, surrounding the guide-rod C⁵. It will thus be seen that when a high portion of the peripheral cam-surface of the
130 pattern-cam engages the roller L² it will move the bell-crank lever L upon its pivot, oscillate the rock-arm L⁴, and move the finger L⁶ against the hub C⁴, thus forcing said hub for-

ward against the action of the compression-spring C⁶, thereby moving the carriage forward to its foremost position and preventing its reciprocation by the eccentric B¹⁶. The carriage will thus be held out of operation as long as the high point of the peripheral cam-surface-I⁵ lies under the roller L². When said roller is permitted to descend to its normal position, the finger L⁶ will be withdrawn from its interference with the action of the carriage, and plaiting will go forward, as governed by the groove I⁴ in the face of the pattern-cam, until another projection on the periphery of the cam throws the carriage out of reach of the eccentric B¹⁶.

In the operation of this plaiting mechanism the sewing-machine is threaded in the usual manner, the needle A³ and the presser-foot H raised, and the ribbon to be plaited passed between the guide-fingers D', through the throatway E² of the blade-carrying bar E, between the blades G and G', and under the needle A³. If several ribbons of different widths are to be plaited together, each one of the ribbons is passed between a pair of guide-fingers D' and each pair of guide-fingers adjusted to the width of the ribbon lying between them. The end of the ribbon under the needle is placed centrally of the scale H² on the work-plate of the sewing-machine, the presser-foot depressed upon the end of the ribbon or ribbons, and motion imparted to the sewing-machine.

By means of the gear connection hereinbefore described, the eccentric B¹⁶, and the restoring-spring C⁶ the carriage-frame D is reciprocated in front of the moving needle A³. If the mechanism were not controlled by the cam I, it would make an unbroken series of side plaits in the ribbon. The rotation of the pattern-cam by reason of the engagement of the pawls J⁶ with the ratchet-teeth I³ of said pattern-cam moves the lever K, whose roller K² lies within the cam-groove I⁴ in the face of the pattern-cam, which roller through its pivotal connections oscillates the yoke K⁵ and moves the rod F¹⁰ transversely with relation to the movement of the reciprocating carriage. The link F⁹ slides backward and forward upon said rod K⁷, and a sidewise movement of the rod oscillates the link and its integral arm F⁷ upon the pin F⁸, which forms their pivotal support. The movement of the arm F⁷ produces a longitudinal movement of the cam-bars F and F', they by reason of their pivotal cross-head connection being moved in opposite directions. This movement of the cam-bars moves one of the blades forward and the other backward with relation to each other, also tilts the blade-carrying bar E, raising both blades upward against the guide portion H' of the presser-foot H or deflects said blades against the work-plate A⁵. This oscillatory movement of the blade-carrying bar E is caused by the engagement of the pin F⁵ with the spring D⁶ when the blades are raised upward and the engagement of the pin

F⁶ with the spring D⁷ when the blades are depressed. The conformation of the groove I⁴ in the face of the pattern-cam determines the frequency with which these changes in the position of the blades occur. When the blades are depressed against the work-plate, the plaits are turned under the body of the fabric under the needle-bar A², and therefore the crest of the plait is toward the blades. When the blades are elevated into contact with the guide portion H' of the presser-foot H, the plaits are turned over the body of the fabric under the presser-foot H, and therefore the crest of the plait faces away from the plaiting-blades. In box-plaiting two, three, four, or more plaits are made to face away from the plaiting-blades. Then the same number are made to face toward the plaiting-blades. This constitutes a "pile" of box-plaiting. If the cam in control of the mechanism has a peripheral cam-surface I⁵, the carriage will be thrown forward as the last plait of the pile of box-plaiting is made and will be held in this inoperative position for an instant, the feed of the fabric continuing as before. The carriage is immediately released to action and another pile of box-plaiting is formed.

In single box-plaiting the cam-groove I⁴ causes the oscillation of the rod F¹⁰ after each plait in order properly to incline the plaiting-blades and lay the plaits so that they face in the proper directions.

The depth of each plait is governed by the extent of the reciprocatory movement of the plaiting-carriage, and this movement is limited by an adjustment of the stop C⁸. As hereinbefore stated, this stop is moved by turning the adjusting-screw C¹².

To remove the pattern-cam, its supporting-screw I⁶ is withdrawn, the filler-bar J⁷ removed, and the reciprocating bar J², with the shaft B³, moved sidewise to permit the withdrawal of the pawls J⁶ from the ratchet-teeth I³ of the pattern-cam.

I claim as my invention—

1. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; an oscillatory blade-carrying bar having a throatway therein; a cam-bar for each blade, each cam-bar having means by which it is adapted to move the adjacent blade forward and backward relatively to the other blade; means for oscillating said blade-carrying bar; means for bodily reciprocating said blades; and means for fixing the formed plaits.

2. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; an oscillatory blade-carrying bar having a throatway therein; a cam-bar having a cam-slot; a stud on one of the blades, adapted to enter the cam-slot of the cam-bar; means for operating the cam-bar to move one of said blades forward and backward relatively to the other blade; a spring for oscillating the cam-bar;

means for bodily reciprocating said blades; and means for fixing the formed plaits.

3. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; an oscillatory blade-carrying bar having a throatway therein; a cam-bar for each of said blades, each cam-bar having a cam-slot; a stud on each of the blades, adapted to lie within the cam-slot of its adjacent cam-bar; means for moving the cam-bars; means for oscillating said blade-carrying bar to bodily rock the plaiting-blades; means for bodily reciprocating said blades; and means for fixing the formed plaits.

4. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a carriage for said blades; means for reciprocating said carriage; a blade-carrying bar pivotally supported on said carriage; a cam-bar for each of said blades, each of which cam-bars has a cam-groove, and is slidably connected with said blade-carrying bar; a stud on each of the blades, adapted to lie within the cam-groove of its adjacent cam-bar; means for moving said cam-bars to move the blades forward and backward relatively to each other; means operated by the movement of the cam-bars for oscillating said blade-carrying bar to bodily tilt the blades; and means for fixing the formed plaits.

5. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a reciprocating carriage; an oscillatory blade-carrying bar mounted on said carriage, said blades having a sliding connection with said blade-carrying bar; a cam-bar having means by which it is adapted to shift said blades forward and backward relatively to each other; means for oscillating the blade-carrying bar; an eccentric for moving the carriage; and means for fixing the formed plaits.

6. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a reciprocating carriage; an oscillatory blade-carrying bar mounted on said carriage; said blades having a sliding connection with said blade-carrying bar; a cam-bar for each of said blades, each cam-bar having a cam-slot; a stud on each of the blades, adapted to lie within the cam-slot of its adjacent cam-bar; means for moving the cam-bars; means for oscillating said blade-carrying bar to bodily tilt the plaiting-blades; and means for fixing the formed plaits.

7. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a reciprocating carriage; an oscillatory blade-carrying bar mounted on said carriage, said blades having a sliding connection with said blade-carrying bar; a cam-bar for each of said blades, each cam-bar having a cam-slot; a

stud on each of said blades, adapted to lie within the cam-slot of its adjacent cam-bar; means for moving the cam-bars; a spring for tilting the blades upward; a spring for tilting them downward; an eccentric for moving the carriage; and means for fixing the formed plaits.

8. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a carriage for supporting said blades; means for reciprocating said carriage; a guide-rod extending transversely of said carriage; a pair of guide-fingers for the fabric to be plaited, mounted upon said guide-rod; and a right and left screw-threaded rod having a screw-thread connection with said guide-fingers for moving them longitudinally of said guide-rod toward or from one another.

9. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; an oscillatory blade-carrying bar having a throatway therein; a cam-bar for said blades, each cam-bar having means by which it is adapted to shift its said blade forward and backward relatively to the other blade; a slidable carriage for bodily carrying said blades; ways for supporting said carriage; an eccentric for moving said carriage on said ways; means for oscillating said blade-carrying bar to bodily rock the plaiting-blades; a sewing-machine for fixing the formed plaits, which sewing-machine has a rotatory shaft; and a mechanism for connecting said shaft with said eccentric for rotating the latter.

10. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; an oscillatory blade-carrying bar having a throatway therein; a cam-bar for each of said blades, for shifting said blades forward and backward relatively to each other; means for actuating said cam-bar; a slidable carriage for bodily carrying said blades; ways for supporting said carriage; an eccentric for moving said carriage in one direction on said ways; a spring for moving said carriage in the contrary direction on said ways; a sewing-machine for fixing the plaits, said sewing-machine having a rotatory shaft and intermeshing gear for imparting the motion of said shaft to said eccentric to rotate the latter to slide said carriage forward and backward; and means for bodily rocking the plaiting-blades.

11. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a blade-carrying bar; a cam-bar for shifting one of said blades forward and backward relatively to the other blade; means for bodily reciprocating said blades; a pattern-cam; means for moving said cam; a mechanism controlled by said cam, for moving said cam-bar; and means for fixing the formed plaits.

12. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a blade-carrying bar; a cam-bar for shifting one of said blades forward and backward relatively to the other blade; means for bodily reciprocating said blades; a pattern-cam; means for moving said cam; a mechanism controlled by said cam, for moving said cam-bar; means actuated by the movement of said cam-bar, for tilting the blades bodily; and means for fixing the formed plaits.

13. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a blade-carrying bar; a cam-bar for shifting one of said blades forward and backward relatively to the other blade; means for bodily reciprocating said blades; a pattern-cam having a cam-groove in its face; means for rotating said cam; a lever adapted to engage said groove; a mechanism for transmitting movement from said lever to said cam-bar; and means for fixing the formed plaits.

14. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a blade-carrying bar having a throatway therein; a cam-bar for each blade; a carriage; means for reciprocating said carriage; a pattern-cam having a cam-groove in its face; means for rotating said cam; a lever adapted to engage said groove; a yoke adapted to be moved by said lever; a pivoted link for communi-

cating motion from said yoke to said cam-bar; and means for fixing the formed plaits.

15. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a carriage for supporting said blades; an eccentric for moving said carriage in one direction; a spring for moving the carriage in the opposite direction; a pattern-cam; means for moving said cam; a mechanism controlled by said cam for shifting one of said plaiting-blades relatively to the other blade; a mechanism controlled by said pattern-cam, for withdrawing said carriage from the operation of the eccentric; and means for fixing the formed plaits.

16. In a plaiting mechanism, in combination, two plaiting-blades adapted to pass the material to be plaited between them; a reciprocatory carriage for supporting said blades; an eccentric for moving said carriage in one direction; a spring for moving said carriage in a contrary direction; a pattern-cam; means for moving said cam; a mechanism controlled by said cam for shifting one of said blades relatively to the other blade; a mechanism controlled by said pattern-cam, which mechanism comprises a finger adapted to hold the carriage forward against said spring; and means for fixing the formed plaits.

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Witnesses:

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